
Promoting survival and countering hypertrophy of pluripotent stem cell (PSC)-derived chondrocytes

Grant Award Details

Promoting survival and countering hypertrophy of pluripotent stem cell (PSC)-derived chondrocytes

Grant Type: Basic Biology V

Grant Number: RB5-07230-A

Project Objective: To dissect the role of pericytes in controlling the specification and survival of functional articular chondrocytes derived from hPSC via paracrine factors, and in turn to develop new strategies for articular cartilage restoration.

Investigator:

Name:	Denis Evseenko
Institution:	University of California, Los Angeles
Type:	PI

Disease Focus: Arthritis

Human Stem Cell Use: Embryonic Stem Cell

Award Value: \$411,330

Status: Closed

Progress Reports

Reporting Period: Year 1

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Grant Application Details

Application Title: Promoting survival and countering hypertrophy of pluripotent stem cell (PSC)-derived chondrocytes

Public Abstract:

Degenerative joint disease, also known as osteoarthritis, currently affects more than 20 million people in the USA alone, making articular cartilage restoration one of the major priorities in medicine. Articular chondrocyte progenitors are likely to be present only early in development, which explains why previous attempts to engineer articular cartilage using adult stem cells have been unsuccessful. Recapitulation of the human chondrogenic program using human pluripotent stem cells (hPSC) may represent a groundbreaking system for cartilage restoration. We hypothesize that regeneration of articular cartilage requires not only generation of structural cartilage cells, but also a supportive "niche" component absent or not fully represented in the adult joint. The overall goal of this research proposal is to dissect the cellular and molecular components of this chondrogenic "niche" essential for the survival, maintenance and expansion of cartilage cells produced from hPSC. The findings from these studies will not only contribute towards our understanding of how articular cartilage is formed during hPSC differentiation, but will also have broad applicability for the production of other types of tissues from hPSC. Most importantly, the ability to control differentiation from hPSC into the articular chondrocyte lineage may provide an unlimited source of matched cells for transplantation in patients with joint cartilage degeneration

Statement of Benefit to California:

The unique combination of pluripotentiality and an unlimited capacity for proliferation have raised the hope that pluripotent stem cells (PSC) will one day provide an inexhaustible source of tissue for transplantation and regeneration. Degenerative joint cartilage disease, also known as osteoarthritis, is one of the most common chronic diseases among Californians, causing significant pain and loss of mobility and impairing earning capacity. Tens of thousands of Californians go through invasive and expensive total joint replacement surgery every year. This proposal explores the question of what unique molecular signals control the survival and maintenance of cartilage cells (also known as chondrocytes) produced during the differentiation of PSC. The research proposed in this application has broad potential benefits for Californians, both through the biological questions it will answer and the relevance of its findings for clinical translation. The development of a human cell culture system that could expand the number of available articular chondrocytes would provide new opportunities for transplantation for patients with cartilage injury or degenerative arthritis and potentially delay or even prevent these patients from needing joint replacement procedures. All the scientific findings and technical tools developed in this proposal will be made available to researchers throughout California, according to the guidelines of the California Institute of Regenerative Medicine

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